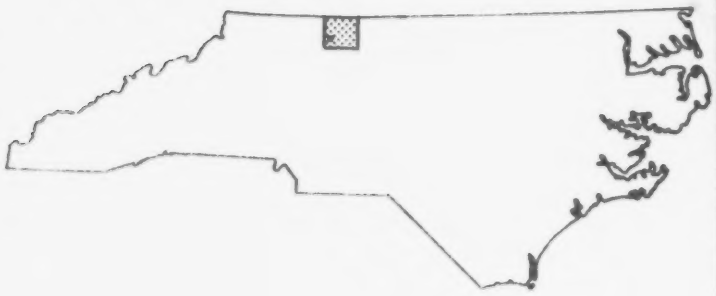
APR 1 1 1989

FLOOD INSURANCE STUDY

CITY OF KING, NORTH CAROLINA

STOKES COUNTY



JULY 4, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 370458

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

CITY OF KING,
STOKES COUNTY,
NORTH CAROLINA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of King, Stokes County, North Carolina, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey (USGS) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 5. This study was completed in August 1987.

1.3 Coordination

On June 23, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of King and its extraterritorial jurisdiction, Stokes County, North Carolina. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by overflow of Crooked Run Creek and Danbury Creek was studied in detail.

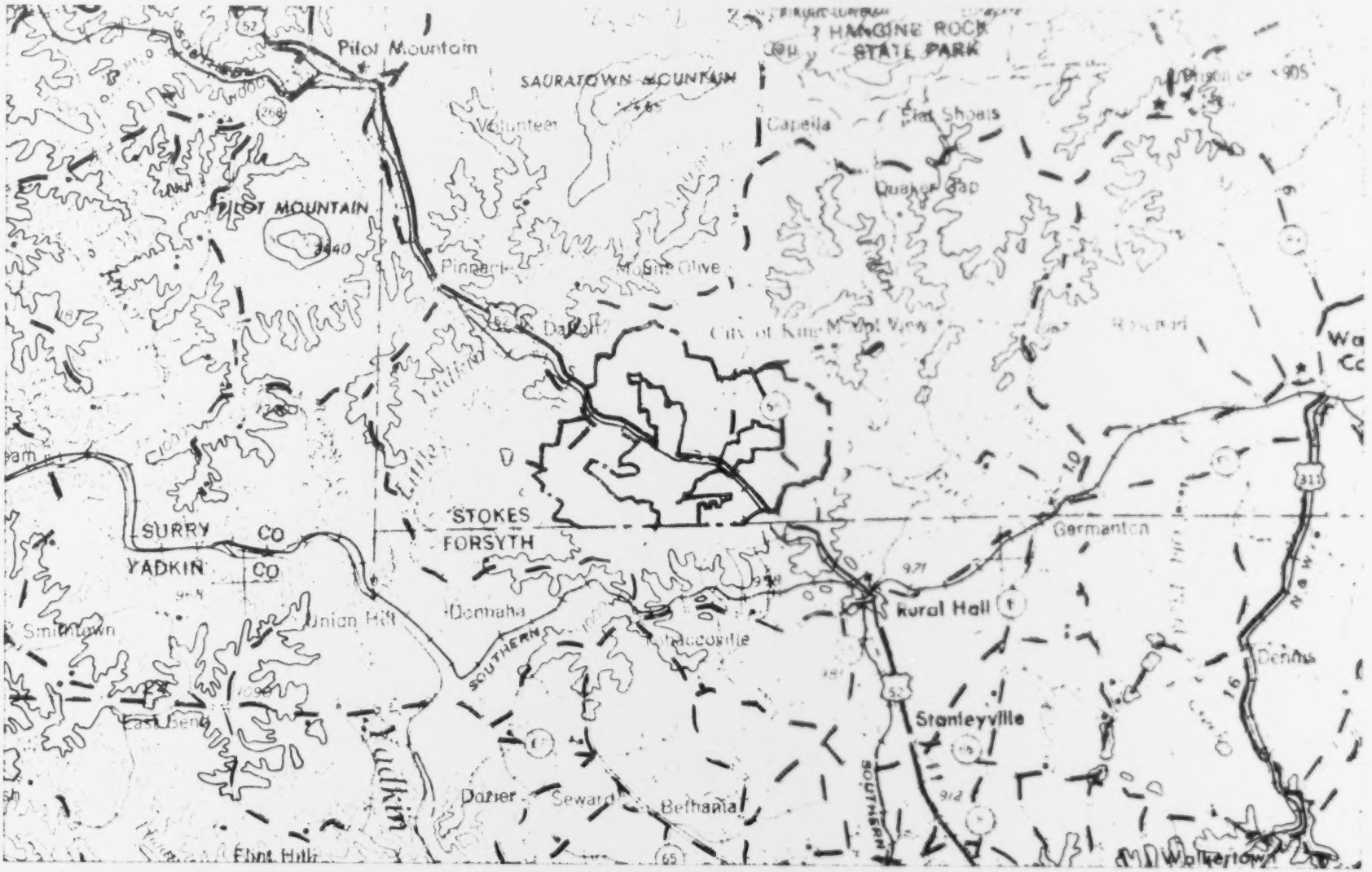


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF KING, NC
(STOKES CO.)

APPROXIMATE SCALE

VICINITY MAP

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Stokes County, North Carolina (Reference 1) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through August 1992. The scope and methods of study were proposed to and agreed upon by FEMA and the City of King.

2.2 Community Description

The City of King is in southwestern Stokes County in the north-central part of the Piedmont province of North Carolina. King is bordered by the unincorporated areas of Stokes County on the north, east, and west, and by Forsyth County, North Carolina, on the south. The city is served by U.S. Route 52 and the Norfolk Southern Railway. The 1980 population of King was reported to be 8,757 (Reference 2).

2.3 Principal Flood Problems

The main sources of flooding within King are Danbury and Crooked Run Creeks. These creeks are relatively small but are steep and swift flowing. Floods can occur at any time during the year, but major floods are more likely to occur during the hurricane season, July to November.

There are no continuous-record stream gages located on the streams in the study area. Residents in both drainage basins have reported that the August 1985 flood was the largest they had ever seen; however, large floods are believed to occur more frequently since development has started in the basins.

2.4 Flood Protection Measures

There are no flood protection measures on Danbury Creek. On Crooked Run Creek, there is a U.S. Soil Conservation Service flood-control dam designed to control the 100-year flood with a design release rate of 116 cubic feet per second. This dam controls drainage from 2.2 square miles and is located just upstream of U.S. Route 52. It was reported that this dam was overtopped during the August 1985 flood.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the

recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Equations from USGS Water-Supply Paper 2207 (Reference 3) were used to estimate peak flows for this study. Land-use data for Danbury Creek and Crooked Run Creek watersheds were determined from topographic maps (Reference 4) and field inspections. The urban equation was used for both streams to estimate the 100-year flood discharges. The rural flood discharge was computed using an equation developed by the USGS (Reference 5).

Peak discharge-drainage area relationships for the 100-year flood of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS*) 100-YEAR
CROOKED RUN CREEK		
about 1,100 feet downstream of White Road	1.86	1,110
just upstream of White Road	1.46	942
DANBURY CREEK		
just upstream of confluence of Goff Creek	2.54	1,370
about 3,400 feet downstream of Brown Road	2.10	1,200

*cubic feet per second

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The cross sections of the floodplain channel for the creeks in the study area were field surveyed.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations. Starting water-surface elevations for the streams studied were determined by the slope-area method. For Crooked Run and Danbury Creeks, water-surface elevations for the 100-year flood were computed using the WSPRO (Reference 6) and J635 (Reference 7) step-backwater computer programs.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 4).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for Stokes County (Reference 1).

4.2 Floodways

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways have not been shown or computed for this community. Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study published for Forsyth County, North Carolina (Reference 8) is in agreement with this Flood Insurance Study.

A Flood Insurance Study in progress for Stokes County, North Carolina (Reference 9) is in agreement with this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Stokes County, Unincorporated Areas, North Carolina, March 1979.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, North Carolina, Washington, D.C., February 1982.

3. U.S. Geological Survey, Water-Supply Paper 2207, Flood Characteristics of Urban Watersheds in the United States, V.B. Sauer, 1983.

4. ————, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: King, North Carolina, 1971.

5. U.S. Department of the Interior, Geological Survey, Water-Resources Investigations Report, Magnitude and Frequency of Floods in North Carolina, N. Macon Jackson, Jr., Washington, D.C., 1976.

6. U.S. Department of Transportation, Federal Highway Administration, Report NO. FHWA/RD-86/108, Bridge Waterways Analysis Model: Research Report, J.O. Shearman, W.H. Kirby, V.R. Snyder, and H.N. Flippo, July 1986.

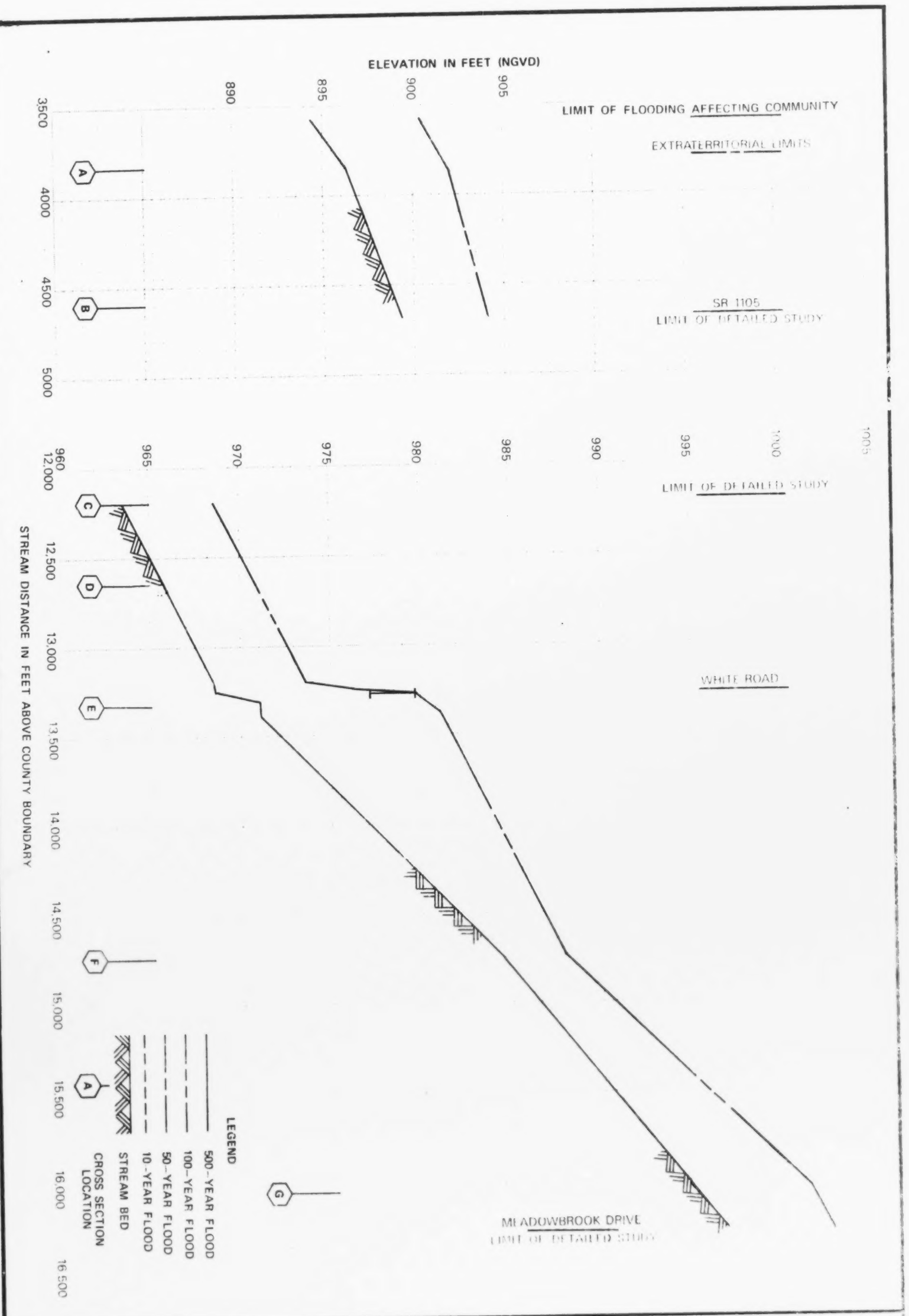
7. U.S. Geological Survey, Water Resources Division, User's Guide, Step-Backwater and Floodway Analyses, J.O. Shearman, May 1977.

8. Federal Emergency Management Agency, Flood Insurance Study, Forsyth County, Unincorporated Areas, North Carolina, January 1984.

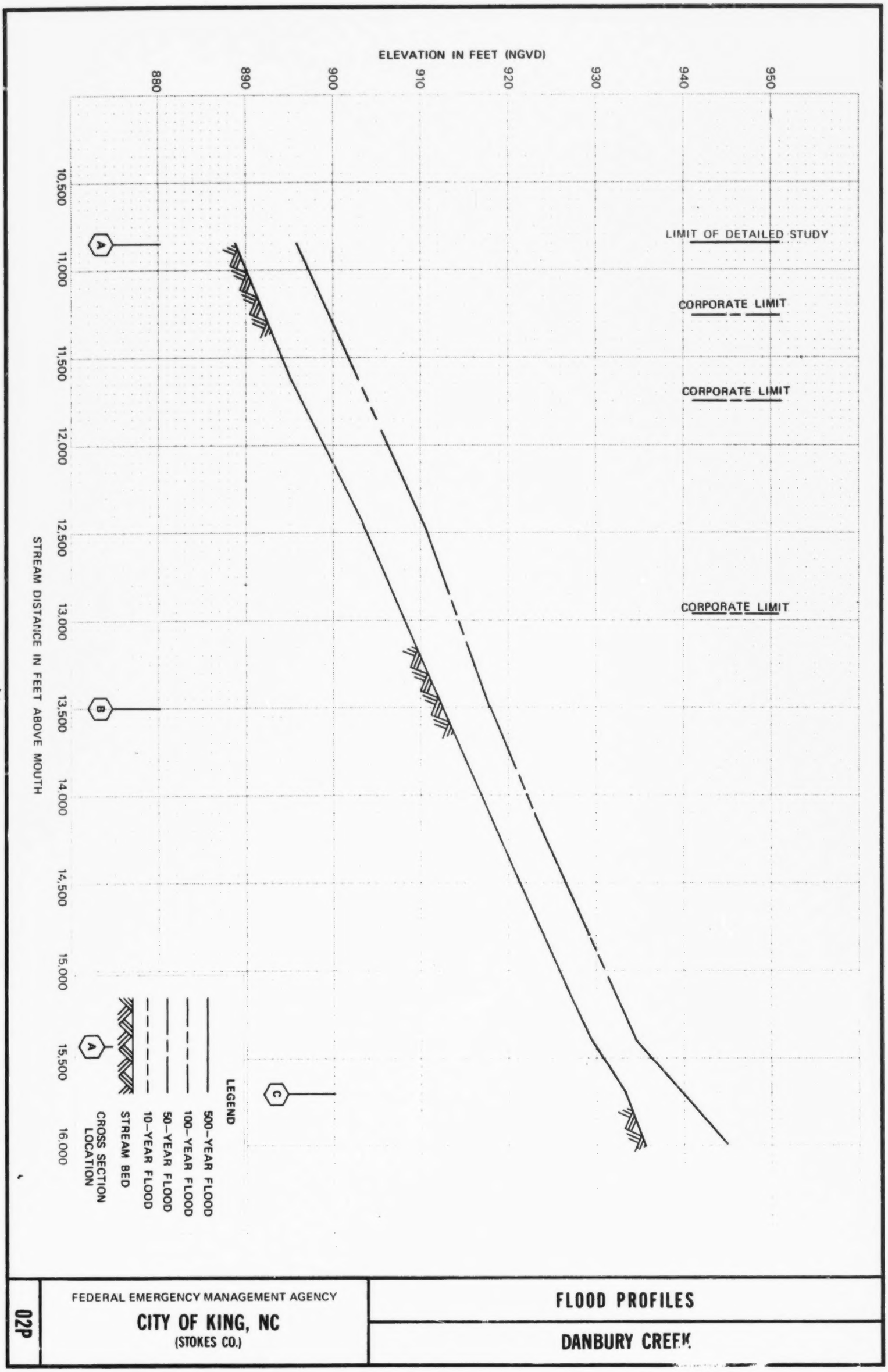
9. ————, Flood Insurance Study, Stokes County, Unincorporated Areas, North Carolina, in progress.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0004	976.83	head of nail in base of 20-inch pine tree located on north bank of Crooked Run Creek, 70 feet upstream of culvert under White Road
2	0004	1,008.3	pk nail in surface of Meadowbrook Drive between two pipe culverts for Crooked Run Creek
3	0001	892.18	chiseled square on left upstream wingwall of Goff Road bridge over Danbury Creek
4	0001	957.49	three hacksaw cuts in manhole rim located on northwest side of culvert for Danbury Creek under Brown Road, 51 feet from right culvert barrel



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **CITY OF KING, NC** (STOKES CO.)	**FLOOD PROFILES** **CROOKED RUN CREEK**



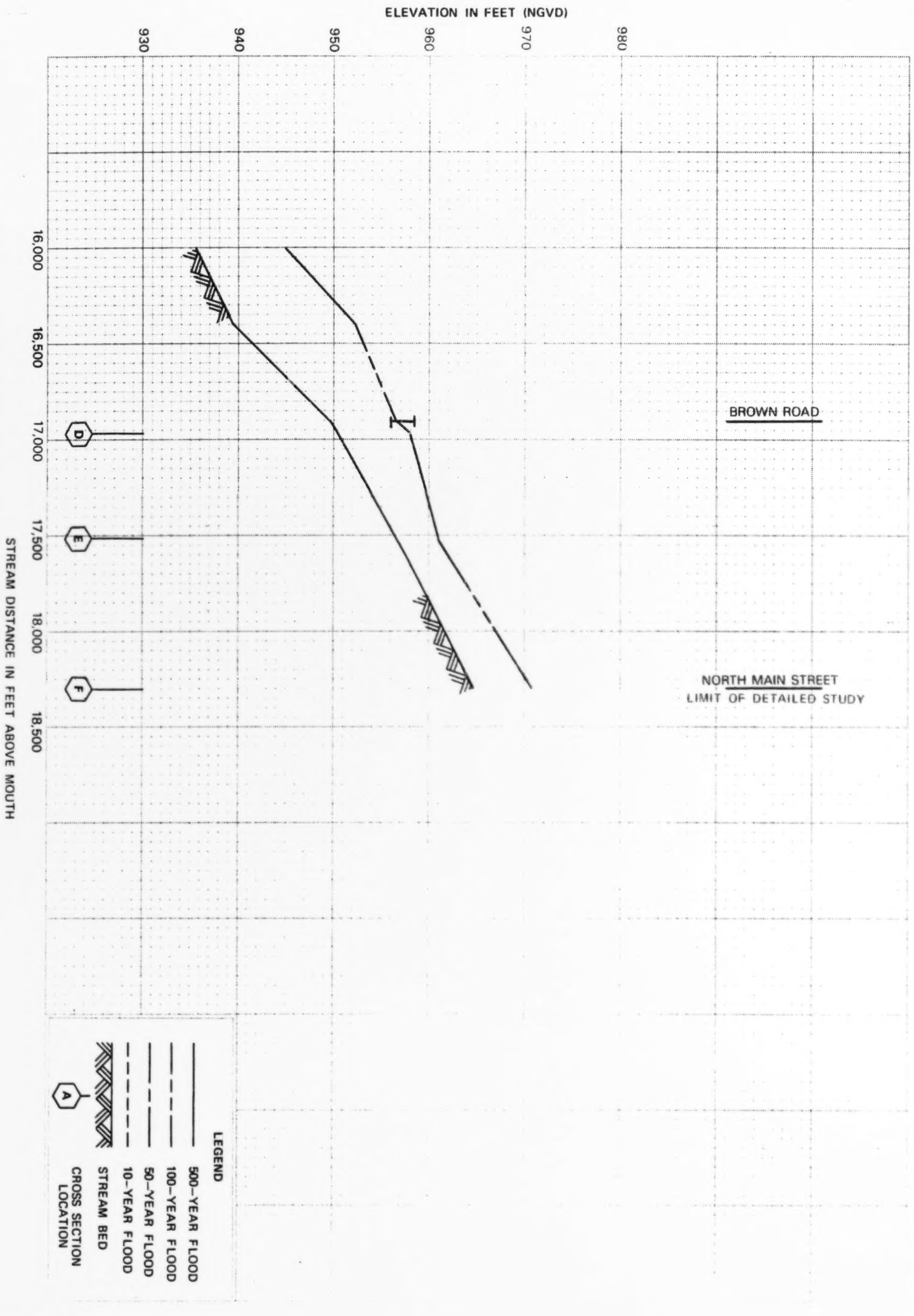
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF KING, NC
(STOKES CO.)

FLOOD PROFILES

DANBURY CREEK



03P	FEDERAL EMERGENCY MANAGEMENT AGENCY **CITY OF KING, NC** (STOKES CO.)	**FLOOD PROFILES** **DANBURY CREEK**